

REMARKS

Claims 20-31 were pending. In the present response, the Applicant has left claims 20-31 pending in the present application for the Examiner's consideration. No new matter has been added.

In summary of the Office Action of June 1, 2004, the Examiner has rejected claims 20-31 under 35 U.S.C. § 103(a) as being unpatentable over Baum et al., U.S. Patent No. 4,928,239, ("Baum") in view of Yeager, U.S. Patent No. 6,594,728 B1 ("Yeager").

The Applicant respectfully traverse the Examiner's rejection.

I. Attribution Does Not Require Common Inventors or Assignee.

The Examiner has rejected claims 20-31 as unpatentable over Baum et al., U.S. Patent No. 4,928,239, ("Baum") in view of Yeager. In response to this rejection, the Applicant previously submitted an affidavit under 37 C.F.R. 1.132. The Applicant's prior affidavit unequivocally states that the portion of Yeager cited by the Examiner should be attributed to the Applicant. Because an applicant's own work may not be used against him unless there is a time bar under 35 U.S.C. 102(b), see In re DeBaun, 687 F.2d 459, (CCPA 1982), this portion of Yeager, which was filed less than one year before the parent of the present application, is not prior art.

In the current Office Action, the Examiner states that attribution only applies when there are common inventors and/or assignee and thus this affidavit is insufficient to disqualify the cited portion of Yeager as prior art. The Examiner cites MPEP 716.10 for this proposition.

The Applicant respectfully disagrees with the Examiner's assertion that attribution requires common inventors and/or assignees. The Applicant cannot find anything in MPEP 716.10 or elsewhere that states common inventors and/or assignees are a requirement for attribution. In several telephone conferences with the Applicant's representative, the Examiner was not able to recall a specific portion of MPEP 716.10 that states this requirement.

The Applicant cannot find any legal precedent requiring common inventors and/or assignees for attribution. The Applicant can find no statute or regulation that states this requirement, and there are no cases supporting this proposition.

Moreover, the Applicant notes that the MPEP cites several example applications of attribution in which there was no common inventor or assignee. First, MPEP 716.10 recites "Example 2," in which a hypothetical reference fully describing the claimed invention of an application is dated less than one year prior to the filing date of the application. In "Example 2," the "author or patentee is an entity different from the applicant." MPEP, 8th Ed., Rev. 2, p. 700-270. (Emphasis Added). "In the situation described in Example 2, an affidavit under 37 C.F.R. 1.132 may be submitted to show that the relevant portions originated with or were obtained from the applicant." Id.

II. The Cited Portion of Yeager Was Derived from the Applicant.

The Applicant believes that attribution does not require common inventors or an assignee. However, to expedite the allowance of this application, the Applicant submits the following evidence that the portion of Yeager patent cited by the Examiner against the pending claims was derived from the Applicant.

Enclosed with this amendment is the Declaration of Todd C. Mowry, who is the inventor of the present application. In the Declaration, the Applicant unequivocally declares that he is the inventor of the subject matter disclosed in Yeager pertaining to "prefetching hints." Specifically, the Applicant unequivocally declares that he is the inventor of the subject matter disclosed in column 6, line 52 to column 7, line 11 of the Yeager patent, which has been cited by the Examiner against the pending claims in the present Office Action. The Applicant also declares that the invention of prefetching hints was disclosed to Kenneth Yeager during the course of their employment with Silicon Graphics, Inc.

As evidence of his employment with Silicon Graphics, Inc., Exhibit A of the Declaration of Todd C. Mowry is a copy of a consulting agreement between Mr. Mowry and Silicon Graphics, Inc. As evidence of Mr. Mowry's invention of prefetching hints, Exhibit B of the

Declaration of Todd C. Mowry is an excerpt of Mr. Mowry's May 1994 dissertation describing aspects of his invention of prefetching hints.

Also enclosed with this amendment is the Declaration of Kenneth C. Yeager, who is the inventor of the Yeager patent cited by the Examiner against the currently pending claims. In his declaration, Mr. Yeager unequivocally declares that he is not the inventor of the subject matter of prefetching hints in the Yeager patent. Mr. Yeager further declares that the subject matter of prefetching hints in the Yeager patent, including the portion cited by the Examiner against the pending claims, was invented by Mr. Mowry. Mr. Yeager also declares that Mr. Mowry disclosed the subject matter of prefetching hints to him during the course of their employment with Silicon Graphics, Inc.

As evidence of his employment with Silicon Graphics, Inc., Exhibit A of the Declaration of Kenneth C. Yeager is a copy of a Confidential Information and Inventions Agreement between Mr. Yeager and Silicon Graphics, Inc.

The Applicant respectfully submits that the enclosed declarations and supporting exhibits establish that the portion of the Yeager patent directed to prefetching hints was derived from the Applicant. Therefore, this portion of the Yeager patent is not prior art against the pending claims.

CONCLUSION

In view of the foregoing, the Applicant respectfully submits that the Yeager patent is not prior art to the present application. Therefore, the Applicant believes all claims now pending in this application are patentable and in condition for allowance and respectfully request an action to that end.


Appl. No. 09/804,677
Amdt. dated July 1, 2005

PATENT

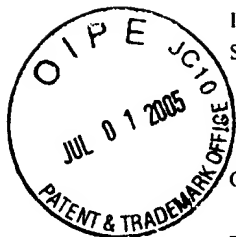
The Applicant invites the Examiner to contact the undersigned if he believes a telephone conference would expedite the prosecution of this application.

Respectfully submitted,

7/1/05
Date


Jonathan M. Hollander
Reg. No. 48,717

TOWNSEND and TOWNSEND and CREW LLP
Two Embarcadero Center, Eighth Floor
San Francisco, California 94111-3834
Tel: 415-576-0200
Fax: 415-576-0300
Attachments
JMH:gsh
60242332 v2



I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to:

PATENT
Docket No.: 019427-004930US
Client Ref. No.: 0049.30US

On _____

TOWNSEND and TOWNSEND and CREW LLP

By: _____

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:

MOWRY, TODD C.

Patent No.:

Issued:

Application No.: 09/804,677

Filed: March 12, 2001

For: PREFETCHING HINTS

Examiner: Portka, Gary J.

Art Unit: 2188

DECLARATION UNDER

37 C.F.R. § 1.132

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

I, Todd C. Mowry, state as follows:

1. I am the inventor of the invention claimed in U.S. Patent Application No. 09/804,677, filed March 12, 2001 (herein "the '677 Application"), which claims priority to U.S. Patent Application Nos.: 08/982,244, filed 12/01/1997, Patent No. 6,240,488, issued 05/20/2001; which is a continuation of 08/410,524, Filed 03/24/1995, Patent No. 5,732,242, issued 03/24/1998.

2. I understand that the pending claims of the '677 Application, claims 20-31, stand rejected over Baum et al., U.S. Patent No. 4,928,239 in view of Yeager, U.S. Patent No. 6,594,728 B1 (herein "the Yeager Patent"). The Yeager Patent claims priority to U.S. Patent Application No. 08/324,124, filed on October 14, 1994.

3. All of the activities described in this declaration took place within either the United States or within Canada, a NAFTA country, after December 8, 1993.

4. Prior to October 14, 1994, Silicon Graphics, Inc. hired me as a consultant. I worked for Silicon Graphics in this capacity up to and after October 14, 1994. As evidence of my employment relationship with Silicon Graphics, Inc., I have attached hereto Exhibit A.

5. Exhibit A is a true copy of my consulting agreement with Silicon Graphics, Inc. with portions redacted.

6. During my employment with Silicon Graphics, Inc., I worked with Kenneth Yeager, the inventor of the Yeager Patent, on the development of a microprocessor that was identified internally by the code name "T5" and externally by the commercial name "R10000."

7. The Yeager Patent, U.S. Patent No. 6,594,728 B1, includes some discussion directed to prefetch instructions with hint fields, including column 6, line 52 to column 7, line 11, which has been cited by the Examiner and corresponds to page 11, lines 5-31 of Yeager's original patent application. This portion of the Yeager Patent is referred to herein as the "Cited Subject Matter."

8. I hereby unequivocally declare that I am the inventor of the Cited Subject Matter.

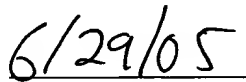
9. Prior to October 14, 1994 and as part of my employment relationship with Silicon Graphics, Inc., I conceived the Cited Subject Matter. As evidence of my conception, I have attached Exhibit B.

10. Exhibit B is a true copy of an excerpt from Stanford University Technical Report CSL-TR-94-628, published June 1994, which comprises my dissertation dated May 1994 entitled, *Tolerating Latency Through Software-Controlled Data Prefetching*. A brief description of my invention directed to prefetching hints is set out on pages 171 and 172. This description does not appear in my dissertation dated March 1994.

11. Prior to October 14, 1994 and as part of my employment with Silicon Graphics, Inc., I disclosed the Cited Subject Matter to Kenneth Yeager.

I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true and further that these statements are made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.


Todd C. Mowry


Date

JMH:jmh

— SILICON GRAPHICS, INC.
INDIVIDUAL CONSULTANT AGREEMENT

THIS INDIVIDUAL CONSULTANT AGREEMENT is made the _____ day of _____ 19____ by and between

Todd M. Wray

an individual having an address of _____ ("Consultant"), and Silicon Graphics, Inc., having a place of business at 2011 N. Shoreline Blvd., Mountain View, CA 94039-7311 ("SGI"). SGI and Consultant desire to enter into a relationship whereunder Consultant will provide certain services to, and perform certain work for, SGI. To set forth the terms and conditions applicable to the foregoing, the parties agree as follows:

1.0. DEFINITIONS.

1.1. "Agreement" means this Individual Consultant Agreement.

1.2. "Confidential Information" means information that concerns, without limitation, SGI's business, plans, customers, technology or products, and is proprietary and/or confidential in nature.

1.3. "Services" means, collectively and individually, as the context requires, the tasks and assignments to be performed by Consultant hereunder, described on Exhibit B hereto.

1.4. "Work Product" means, collectively and individually, as the context requires, all copyrights, patents, trade secrets, or other intellectual property rights associated with any ideas, concepts, techniques, inventions, processes, or works of authorship developed or created by Consultant during the course of performing Services, which shall, to the extent possible, be considered works made for hire within the meaning of the Copyright Act (17 U.S.C. § 101 et seq.).

2.0. COMPENSATION; INDEPENDENT CONTRACTOR STATUS.

2.1. Compensation. SGI agrees to pay Consultant for Services performed by Consultant in accordance with Exhibit B hereto. Except as otherwise specifically set forth on Exhibit B, Consultant shall be responsible for all costs and expenses that it incurs incident to the performance of Services. Except as expressly set forth in this Agreement, SGI shall not be liable to Consultant for any debts, accounts, obligations or other liabilities of Consultant or any other third parties.

2.2. Independent Contractor Status. It is the intention of the parties that Consultant be an independent contractor, and not an employee, agent, joint venturer or partner of SGI. Nothing in this Agreement shall be interpreted or construed to create or establish the relationship of employer and employee between SGI and Consultant. Consultant represents and acknowledges that, as an independent contractor, it is not acting as an agent or employee of SGI and is operating a separately established business. Consultant further

agrees and acknowledges that, because Consultant is an independent contractor, and is not an employee of SGI, Consultant is not now, and will not be in the future, entitled to (i) make a claim for unemployment, worker's or disability compensation pursuant to this Agreement or Consultant's relationship with SGI, or (ii) receive any vacation, health or retirement benefits pursuant to this Agreement, or Consultant's relationship with SGI. SGI will not (a) withhold FICA (Social Security) from its payments to Consultant, (b) make state or federal unemployment insurance contributions on behalf of Consultant, or (c) withhold state and federal income tax from its payments to Consultant. Consultant hereby represents that, as an independent business owner, it is covered by appropriate insurance, including, as applicable, disability, workmen's compensation or other such insurance, and agrees that, except as otherwise expressly provided herein, all activities and work performed under by Consultant under this Agreement shall be at Consultant's own risk and liability. Consultant's business license and/or Social Security Number is _____.

2.3. Non-exclusive Relationship. This Agreement is non-exclusive. Consultant shall retain the right to perform work for others during the term of this Agreement. SGI may cause work of the same or a different kind to be performed by its own personnel or other contractors during the term of this Agreement.

3.0. SERVICES; SUPERVISION BY SGI.

3.1. Services. Consultant agrees to provide the Services set forth on Exhibit B to SGI. SGI may change the scope of Services at SGI's sole discretion, provided that any such change shall be subject to Consultant's acceptance, and to the parties' mutual agreement regarding Consultant's fees for any new tasks and the period of time required for the performance of such tasks. The parties shall set forth any such modifications hereunder in a signed, written amendment hereto.

3.2. Method of Performing Services; Supervision. Consultant will generally determine the method, details, and means of performing Services. SGI shall not have the right to control the exact manner or determine the precise method of accomplishing Services. However, SGI shall require Consultant to observe SGI's security and safety policies at all times. In addition, SGI shall be entitled to exercise a broad, general right of supervision and control over the results of Services performed by Consultant to ensure satisfactory performance. This power of supervision shall include the right to inspect, stop work, make suggestions or recommendations as to the details of the work, and request modifications to the scope of the Services.

3.3. Scheduling and Reporting. Consultant will make best efforts to accommodate SGI's work schedule requests. If Consultant is unable to perform scheduled Services be-

cause of illness or other causes beyond Consultant's reasonable control, Consultant will attempt to perform such Services as soon as is reasonably practicable, but Consultant shall not be liable for failure if it is unable to do so, giving due regard to its other commitments and priorities. SGI will advise Consultant of the SGI employee(s) or agent(s) to whom Consultant will report its progress on Services.

3.4. Place of Work. Consultant will perform Services primarily at SGI's premises, except when certain projects or tasks may be, as mutually determined, performed off-site. SGI agrees to provide working space and facilities, and any other services that Consultant may reasonably request in order to perform Services.

4.0. CONFIDENTIAL INFORMATION.

4.1. Confidential Information. Consultant shall maintain in strict confidence, and shall use and disclose only as authorized by SGI, all Confidential Information that it receives in connection with its relationship with SGI or in its efforts to provide Services hereunder. SGI shall take reasonable steps to identify any Confidential Information, including the use of confidentiality or other reservation of rights notices in tangible material embodying Confidential Information, where appropriate.

4.2. Exclusions. The restrictions in Section 4.1 above shall not apply to information (i) generally available to the public; (ii) released by SGI generally without restriction; or (iii) independently developed by Consultant without reliance in any way on Confidential Information. Further, Consultant may disclose any Confidential Information to the extent required by an order of any court or other governmental authority of competent jurisdiction, but only after Consultant has notified SGI of its intention to so disclose such Confidential Information, and SGI has an opportunity to seek a protective order to otherwise prevent such disclosure.

4.3. Residual Rights of Consultant. Notwithstanding anything to the contrary herein, Consultant shall be free to use and employ its general skills, know-how, and expertise, and to use, disclose, and employ any generalized ideas, concepts, know-how, methods, techniques, or skills gained or learned during the course of the performance of any Services, so long as it acquires and applies such information without disclosure of any Confidential Information and without any unauthorized use or disclosure of Work Product.

5.0. OWNERSHIP OF WORK. Consultant agrees that, in consideration for SGI's payment to Consultant hereunder, all Work Product shall be and remain the property of SGI. To the extent that any such Work Product may not, under applicable law, be considered works made for hire, Consultant hereby transfers, assigns, grants, conveys and relinquishes, and agrees to transfer, assign, grant, convey and relinquish, exclusively to SGI all of Consultant's rights, title and interest in and to Work Product under copyright law, in

perpetuity or for the longest period otherwise permitted under law. Consistent with Consultant's recognition of SGI's complete ownership rights in Work Product, Consultant agrees that it shall (i) not use Work Product for the benefit of any party other than SGI, (ii) execute an "Assignment of Intellectual Property Rights" Agreement (set forth hereto as Exhibit A) concurrently with its execution of this Agreement, and (iii) perform any other acts that SGI may deem reasonably necessary or desirable to evidence more fully the transfer of ownership of Work Product to SGI to the fullest extent possible. If, by operation of law, Consultant is deemed to retain any right in the intellectual property created hereunder, Consultant, to the extent which such right conflicts with any assignment or transfer of rights made by Consultant hereunder, hereby (a) waives all such rights, and (b) assigns to SGI the rights set forth in this Section 5 above.

6.0. WARRANTIES AND INDEMNIFICATION.

6.1. Warranty. Consultant represents and warrants to SGI that Consultant has no knowledge of any claims that would adversely affect Consultant's ability to assign the right, title and interest in and to the Work Product to SGI, (ii) Consultant has all requisite right and authority to enter into this Agreement with SGI, (iii) to the best of Consultant's knowledge, the Work Product does not violate any patent, copyright or other proprietary right of any third party, and (iv) Consultant has the legal right to grant SGI the assignment of Consultant's interest in the Work Product set forth in this Agreement. **THE FOREGOING WARRANTIES ARE EXCLUSIVE, AND CONSULTANT DISCLAIMS ALL OTHER WARRANTIES, EXPRESS, IMPLIED OR OTHERWISE, INCLUDING, WITHOUT LIMITATION, ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.**

6.2. Indemnification. Consultant agrees to protect, defend and indemnify SGI against all costs, expenses, awards, judgments, damages, and reasonable attorney's fees which SGI may incur or be obligated to pay as a result of Consultant's breach of Section 6.1 above.

7.0. LIMITATION OF LIABILITY. EXCEPT FOR MATTERS ARISING OUT OF CONSULTANT'S DEFAULT OF SECTIONS 4 OR 6.1 ABOVE, NEITHER PARTY SHALL BE LIABLE TO THE OTHER FOR ANY INCIDENTAL, INDIRECT, SPECIAL OR CONSEQUENTIAL DAMAGES OF ANY KIND ARISING OUT OF THIS AGREEMENT OR THE RELATIONSHIP BETWEEN SGI AND CONTRACTOR, INCLUDING WITHOUT LIMITATION LOSS OF PROFIT, LOSS OF USE, SAVINGS OR REVENUE, OR THE CLAIMS OF THIRD PARTIES, WHETHER OR NOT ADVISED OF THE POSSIBILITY OF SUCH LOSS, HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, ARISING OUT OF THIS AGREEMENT OR THE RELATIONSHIP OF SGI AND CONSULTANT.

8.0. TERM; TERMINATION.

8.1. Term. This Agreement will become effective on the date first set forth above and will continue in effect through the completion of Services and expiration date set forth on Exhibit B hereto, unless otherwise terminated earlier in accordance with this Section 8.

8.2. Termination of Services and/or Agreement for Convenience by SGI. SGI may, at its sole option, terminate any Services, or any portion thereof, upon thirty (30) days advance written notice. Upon receipt of such notice, Consultant shall advise SGI of the extent to which Consultant has completed Services through such date, and collect and deliver to SGI whatever Work Product then exists, and any physical embodiment thereof, in the manner requested by SGI. SGI shall make a final settlement payment to Consultant for all work performed through the date of termination.

8.3. Termination of Agreement for Default. If either party fails to perform any material obligation under this Agreement, then, upon thirty (30) days prior written notice specifying such default, the other party may terminate this Agreement by further written notice to the defaulting party, unless the breach specified in such notice has been cured during such thirty (30) day period.

8.4. Delivery Of Materials Upon Termination. Consultant agrees, covenants and promises that in the event of the termination or expiration of this Agreement for any reason, Consultant will promptly and without request surrender and deliver to SGI all materials containing, embodying or otherwise evidencing any Confidential Information, regardless of whether any such item or the information contained therein or thereon was prepared, produced or authored by Consultant, except that Consultant may retain a copy of this Agreement for its records.

8.5. Survival. In the event of any termination of this Agreement, Articles 4, 5, 6, 7, 8.5, 9.1 and 9.7 hereof shall survive and continue in effect.

9.0. GENERAL.

9.1. Governing Law, Venue. The parties hereby agree that any dispute regarding the interpretation or validity of, or otherwise arising out of, this Agreement, or relating to the Services provided hereunder shall be subject to the exclusive jurisdiction of the courts, and governed by the laws, of the State of California, excluding its choice of law rules. The parties hereby expressly waive any right to a jury trial and agree that any proceeding hereunder shall be tried by a judge without a jury.

9.2. Representation by Counsel. Consultant hereby certifies and represents that it (i) has been, or had the opportunity to be represented by counsel in the negotiation of this Agreement, and (ii) understands and accepts its rights, duties and obligations under this Agreement.

9.3. Unenforceable Provisions. In the event that any of the provisions of this Agreement shall be held by a court or other tribunal of competent jurisdiction to be unenforceable, the remaining portions of this Agreement shall remain in full force and effect. The failure of either party to enforce at any time, or for any period of time, the provisions hereof shall not be construed to be a waiver of such provisions or of the right of such party to enforce each such provision.

9.4. Assignment. No portion of this Agreement or Consultant's obligations hereunder may be assigned by Consultant without SGI's prior written permission.

9.5. Modifications. Any modifications of this Agreement shall be in writing and signed by both SGI and Consultant.

9.6. Headings. Section and/or paragraph headings used in this Agreement are for reference purposes only and will not be used in the interpretation of this Agreement.

9.7. Complete Agreement. This Agreement, including its Exhibits, constitutes the complete and exclusive statement of the agreement between SGI and Consultant, and it supersedes all proposals, oral or written, and all other communications between SGI and Consultant relating to the subject matter of this Agreement.

SILICON GRAPHICS, INC.

By: [Signature]

Thomas M. McWilliams
NAME (PRINT OR TYPE)

Director of Research
TITLE

[Redacted]
DATE

CONSULTANT

By: [Signature]

Todd C. Maury
NAME (PRINT OR TYPE)

Assistant Professor
TITLE

[Redacted]
DATE

AGREEMENT NO.: _____

EXHIBIT A
ASSIGNMENT OF INTELLECTUAL PROPERTY RIGHTS AGREEMENT

This ASSIGNMENT OF INTELLECTUAL PROPERTY RIGHTS AGREEMENT ("Assignment") is made the 18 day of 19 by and between Todd Mercury ("Consultant") and Silicon Graphics, Inc., having a place of business at 2011 N. Shoreline Blvd., Mountain View, CA 94039-7311 ("SGI").

Consultant and SGI have entered into an Individual Consultant Agreement (the "Agreement") of even date with this Assignment, under which Consultant agreed to provide Services, perform certain assignments and/or create certain Work Product for SGI. Any terms used in this Assignment having initial uppercase letters shall have that meaning ascribed to such terms in Section 1 of the Agreement. In consideration for the payment described in Exhibit B to the Agreement, the sufficiency of which is hereby acknowledged, Consultant hereby assigns, conveys and transfers to SGI any and all rights and ownership of and to the Work Product.

1.0. DESCRIPTION OF WORK PRODUCT. Work Product consists of and is described as: [REDACTED]

2.0. ASSIGNMENT AND TRANSFER OF INTELLECTUAL PROPERTY RIGHTS. Consultant hereby assigns, conveys and transfers, and agrees to assign, convey and transfer, on an exclusive basis all rights, title and interest in and to all Work Product to SGI, its successors, assigns or other legal representatives, without the necessity of any other consideration. This Assignment shall be operative with respect to all intellectual property rights in and to Work Product, including, without limitation, (i) all copyrights worldwide, including all rights of registration and publication, rights to create derivative works, and all other rights incident to copyright ownership, for the residue now unexpired of the present term of any and all such copyrights and any term thereafter during which the Work Product shall be entitled to copyright, and (ii) all trade secrets, inventions, know-how, ideas and confidential information embodied or reflected in Work Product, for the longest period of protection accorded to such interests under applicable law.

Todd C Mercury
Consultant (by date)

[Signature]
SGI (by date)

INDIVIDUAL CONSULTANT AGREEMENT NO.: _____

EXHIBIT B
DESCRIPTION OF SERVICES, WORK PRODUCT, COMPENSATION AND TERM OF AGREEMENT

A. Services to be provided by Consultant to SGI shall be in accordance with the following table (Note: insert "N/A" in payment column if no payment is associated with an item).

[CONTENT REDACTED]

D. Term of Agreement: Consultant shall provide Services from the effective date of this Agreement ()

until ()

Consultant (by date)

SGI (by date)

AGREEMENT NO.: _____

**TOLERATING LATENCY THROUGH
SOFTWARE-CONTROLLED DATA PREFETCHING**

**A DISSERTATION
SUBMITTED TO THE DEPARTMENT OF ELECTRICAL ENGINEERING
AND THE COMMITTEE ON GRADUATE STUDIES
OF STANFORD UNIVERSITY
IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY**

**By
Todd C. Mowry
May 1994**

**Exhibit B
(App. No. 09/804,677)**

```
for (i = 0; i < 1000; i++)  
  for (j = 0; j < n; j++)  
    A[j][0] = A[j][0] + foo(i);
```

Figure 5.30: Example where it is not clear whether to use uncached prefetches.

when the compiler is certain that a reference has no locality.

The second complication, as we mentioned earlier in Section 5.1.3, is the hardware complexity of building the separate target buffer. Given this complexity, it is unclear whether it would be worth building such a structure even to support uncached prefetches.

Prefetching Set Hints

In architectures with set-associative caches, a more attractive technique for preventing data that streams through the cache from displacing other useful data may be a prefetching “set hint” that specifies the set in which prefetched data should be placed. For example, in blocked matrix algorithms, it is desirable for the blocked data to remain in the cache, and not be displaced by the non-blocked data. This could be accomplished by prefetching the blocked data into set 0 of a two-way set-associative cache, and the non-blocked data into set 1. Similarly, if the operating system wished to perform a large block copy operation that would normally flush the entire cache, it could instead prefetch the data only into set 1, thus leaving set 0 intact.

These new prefetching hints might be referred to as “retained” and “streamed” prefetches, which would correspond to placing data in particular subsets of a set-associative cache (e.g., “retained” prefetches go into set 0, and “streamed” prefetches go into set 1). Normal prefetches (i.e. without either of these hints) and loads and stores would use the normal set replacement algorithm to decide where data should be placed.

One advantage of prefetching set hints is that they require no complexity beyond a normal set-associative cache. Therefore the clock rate will not be affected, and the normal coherence mechanism will ensure that prefetches are non-binding in a multiprocessor environment. Another important advantage is that in the default case, the entire cache area can be utilized by any types of references. This is contrast with having a special prefetch target buffer, where normal loads and stores can never utilize the cache area devoted to the target buffer. Thus prefetching set hints provide the flexibility to partition the cache storage area only in cases where the programmer or

compiler has a strong reason to believe that doing so is beneficial.

5.2.3 Reducing Overheads

Since software-controlled prefetching has a cost as well as a benefit, care must be taken when inserting prefetches that the cost does not offset much of the latency-hiding benefit. The first step toward minimizing cost is prefetching *selectively* to avoid the pure overhead of unnecessary prefetches. Our results in Sections 3.2.1 and 4.3.1 demonstrate that selective prefetching can reduce much of the prefetching overhead, and we discussed ways to improve this analysis further in Section 5.2.1. While the remaining overhead after selective prefetching is typically quite small in comparison with the reduction in memory stall time, there are still a few cases where additional speedups of at least 10% could be achieved if it was possible to eliminate the remaining instruction overhead. In this section we will address the second step toward reducing prefetching cost, which is minimizing the instruction overhead of the prefetches that are issued.

Before we begin this discussion, let us consider how future trends are likely to affect the relative importance of prefetching instruction overhead. The first relevant trend is that the gap between processor and memory speeds will continue to grow. As this occurs, the cost of even the current level of instruction overhead will diminish relative to the latency-hiding benefit of each useful prefetch. The second important trend is continued improvements in the ability of processors to exploit instruction-level parallelism through techniques such as *superscalar* processing [75]. Since prefetch instructions can always be executed in parallel with other operations (because no other operations depend upon their completion), they should benefit well from the exploitation of instruction-level parallelism. Therefore the absolute overhead of processing prefetch instructions is likely to decrease. The combined effect of both of these trends is that prefetch instruction overhead should become less significant in the future.

Given these trends, why do we care about prefetch instruction overhead at all? The first reason is that although prefetch instructions can theoretically be executed in parallel with other operations, this will only result in no overhead if there are resources available for executing the prefetches that are normally idle. However, the functional units needed to compute prefetch addresses and issue prefetches will also be busy handling normal loads and stores. Due to competition for these critical resources, it is unlikely that prefetch instruction overhead will be completely hidden. The second reason is that prefetch instruction overhead is an inherent problem in applications where there are few instructions between cache misses. For these applications, the difference of only a single instruction per prefetch can result in a large fractional increase in

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to:

PATENT
Docket No.: 019427-004930US
Client Ref. No.: 0049.30US

On July 1, 2005

TOWNSEND and TOWNSEND and CREW LLP

By: [Signature]

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:

MOWRY, TODD C.

Patent No.:

Issued:

Application No.: 09/804,677

Filed: March 12, 2001

For: PREFETCHING HINTS

Examiner: Portka, Gary J.

Art Unit: 2188

DECLARATION UNDER

37 C.F.R. § 1.132

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

I, Kenneth C. Yeager, state as follows:

1. I am the inventor of U.S. Patent No. 6,594,728 B1 (herein "the Yeager Patent"). The Yeager Patent claims priority to U.S. Patent Application No. 08/324,124, filed on October 14, 1994.

2. The Yeager Patent, U.S. Patent No. 6,594,728 B1, includes some discussion directed to prefetch instructions with hint fields, including column 6, line 52 to column 7, line 11, which has been cited by the Examiner and corresponds to page 11,

lines 5-31 of its parent patent application, U.S. Patent Application No. 08/324,124. This discussion of prefetching hints is not claimed by the Yeager Patent. This portion of the Yeager Patent is referred to herein as the "Cited Subject Matter."

3. I have reviewed the specification and claims of the Yeager Patent, U.S. Patent No. 6,594,728 B1. Based upon my review, I believe that the Yeager Patent does not claim the Cited Subject Matter.

4. All of the activities described in this declaration took place within the United States.

5. Prior to October 14, 1994, Silicon Graphics, Inc. hired me as an employee. I worked for Silicon Graphics in this capacity until December 2003. As evidence of my employment relationship with Silicon Graphics, Inc., I have attached hereto Exhibit A.

6. Exhibit A is a true copy of my Confidential Information and Inventions Agreement with Silicon Graphics, Inc. with portions redacted.

7. During my employment with Silicon Graphics, Inc., I worked with Todd C. Mowry, the inventor of U.S. Patent Application No. 09/804,677 (herein "the '677 Application"), on the development of a microprocessor that was identified internally by the code name "T5" and externally by the commercial name "R10000."

8. Prior to October 14, 1994 and as part of my employment with Silicon Graphics, Inc., Mr. Mowry disclosed the Cited Subject Matter to me. I did not know of the Cited Subject Matter prior to this disclosure.

9. I hereby unequivocally declare that I did not conceive of the Cited Subject Matter and that Mr. Mowry is the inventor of the Cited Subject Matter.

I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true and further that these statements are made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.


Kenneth C. Yeager

June 27, 2005
Date

JMH:jmh



Silicon Graphics
Computer Systems

Kenneth Yeager

CONFIDENTIAL INFORMATION AND INVENTIONS AGREEMENT

In consideration of my employment with Silicon Graphics, Inc. (SGI) and the compensation paid to me, I understand and agree to the following:

1. Confidential Information

I agree at all times, during and following employment with SGI, to hold in strictest confidence any confidential information of the company. I will use such information only for the benefit of SGI and will not disclose it to any person or entity without prior authorization from a company officer. I understand this includes, but is not limited to, any proprietary information, technical data, trade secrets or know-how, customer, product or organizational information.

I agree also not to disclose, nor bring on the premises of SGI, confidential information of any former employer, person or entity which I have an agreement or duty to keep in confidence.

I further agree to keep confidential any third-party information provided to SGI and use it only as necessary related to my work and consistent with SGI's agreement for its purpose and use.

2. Inventions and Original Works

A. Prior Inventions: All inventions, original works of authorship, developments, improvements, and trade secrets which were made by me prior to my employment with SGI (collectively referred to as "prior inventions") are listed and described on the reverse side of this agreement. If not listed, I represent there are no prior inventions.

If I incorporate in an SGI product, process or machine a prior invention owned by me or in which I have an interest, SGI is granted a non-exclusive, royalty-free, irrevocable, perpetual, world-wide license to make, use, license and sell such prior invention as part of or in connection with such product, process or machine.

B. Assignment of Inventions: I agree to assign to SGI or its designee, all rights, title, and interest in and to any inventions, original works of authorship, developments, concepts, improvements, or trade secrets (collectively called "inventions") whether or not patentable or registrable under patent, copyright or similar laws, which I may solely or jointly conceive or develop or reduce to practice during my employment with SGI. I further acknowledge and agree that all original works of authorship made by me, solely or jointly with others, which are protectable by copyright are "works made for hire" as that term is defined in the United States Copyright Act. I agree to waive any and all "moral rights" which I may have in such inventions, and to assign all such "moral rights" to SGI.

C. Maintenance of Records: I agree to keep and maintain adequate and current written records of all inventions made by me (solely or jointly with others) during the term of my employment with SGI. The records will be available to and remain the sole property of SGI at all times.

D. Obtaining Patents and Copyright Registrations: I agree to assist in securing SGI's rights in inventions and any related copyrights, patents, mask work rights or other intellectual property rights in any and all countries, and disclose to SGI all pertinent information and data with respect to those rights, and execute all applications, specifications, oaths, assignments, and any other instruments necessary for SGI to apply for and obtain copyrights, patents and/or mask work rights or to assign and convey to SGI, its successors, assigns and nominees the sole and exclusive rights, title, and interest in and to such inventions and any related copyrights, patents, mask work rights or other intellectual property rights.

This obligation shall continue after termination if my employment with SGI when it is in my power to do so, and if SGI is unable to secure my signature to pursue applications covering inventions or original works of authorship assigned to SGI as described above, then I hereby irrevocably designate and appoint SGI and its duly authorized officers and agents as my agent and attorney in fact to act for and in my behalf and stand to execute and file such applications.

E. Exception to Assignments: I understand that the provisions of this agreement do not apply to any invention which qualifies fully to be excluded pursuant to the provisions of California Labor Code Section 2870 (refer to reverse side). I will advise SGI promptly in writing of any inventions I believe meet such criteria and have not been previously disclosed, with all evidence necessary to substantiate that belief. I understand that SGI will keep in confidence and will not disclose to third parties without my consent any confidential information disclosed to SGI relating to such excluded inventions.

3. Conflicting Employment

During my employment with SGI, I will not engage in any employment, occupation, consulting or other business activity directly related to the business in which SGI is involved, nor will I engage in any other activities that conflict with my obligations to SGI.

4. Returning Company Documents

Upon termination of my employment with SGI, I agree to deliver to SGI (and not keep in my possession or deliver to any one else) any and all equipment, devices, drawings, reports, and other written materials, documents or property, and reproductions of all such items belonging to or prepared by me during the course of my employment by SGI, its successors or assigns. I agree also to comply with all other employment termination procedures in effect at the time of departure.

5. At-Will Employment

I understand and acknowledge that my employment with SGI is for an unspecified duration and constitutes "At-Will" employment. The employment relationship may be terminated at any time, with or without cause, at the option either of SGI or myself, with or without notice.

6. Equitable Relief

I agree it would be impossible or inadequate to measure and calculate SGI's damages from any breach of the covenants set forth herein. I agree therefore that SGI will have, in addition to any other right or remedy available, the right to obtain an injunction from a court of competent jurisdiction restraining such breach or threatened breach and to specific performance of any provision of this agreement. I agree no bond or security shall be required in obtaining such equitable relief and I consent to the granting of such injunction and the ordering of specific performance.

7. General Provisions

No modification of or amendment to this agreement, nor any waiver of any rights under this agreement will be effective unless in writing signed by the party to be charged. Any changes in my duties, salary or compensation will not affect the validity or scope of this agreement.

If one or more of the provisions in this agreement are deemed void by law, then the remaining provisions will continue in full force and effect.

This agreement will be binding upon my heirs, executors, administrators and other legal representatives, and will be for the benefit of SGI, its successors, and its assigns.

This agreement will be governed by and construed in accordance with the laws of the State of California.

Kenneth Yeager

Signature

Date

(Over)

EXHIBIT A

(App. No. 09/804,677)

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